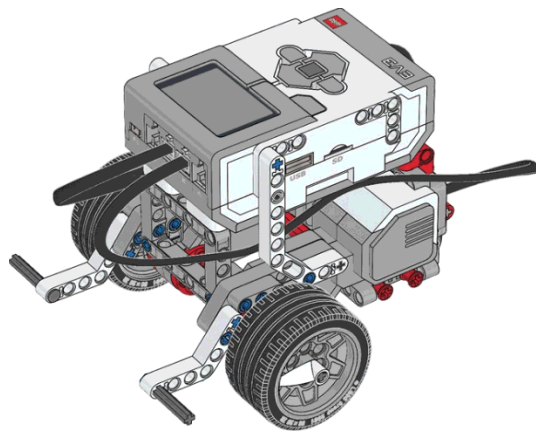# LUNAR ROVER

USER MANUAL

Software Engineering & Project

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Contents

Revision History

Name	Date	Version	Summary of Changes
Pavi	26/10/2017	Version-0.5	Revised section 1 and 2
Sammy	27/10/2017	Version-0.9	Revised section 3 and 4
Pavi	29/10/2017	Version-1.0	Formatting

1 GENERAL INFORMATION

1.1 System Overview

This system consist two components a) The LEGO Mindstorm robot and the software to control it. The main aim of this system is to survey the specified area and safely return back to landing zone. The system is fully developed, tested and operational. GUI is also included in the system in-order to control the robot. The main features of this robot include

- Automatic survey of specified areas
- Remote control manual override and movement
- On-board obstacle avoidance mechanisms
- No-go zone detection and avoidance
- Ability to return to the starting point or any point selected on mapped area.

1.2 Organization of the Manual

1.2.1 User's Manual v1.0.
- Section 1 includes general information about the system
- Section 2 includes system summary
- Section 3 includes how to set up the system
- Section 4 includes how to use the system

1.3 Definitions, Acronyms and Abbreviations

1.3.1 Definitions
- Intellij IDE - Java(IDE) for developing computer software

1.3.2 Acronyms
- RMS - Robot Mapping System
- OS - Operating System
- JRE - Java Runtime Environment
- IDE - Integrated development environment
- NGZ - No Go Zone
- SDD - Software Design Document
- SRS - Software Requirements Specification
- WDDM - Windows Display Driver Model

1.3.3 Abbreviations
- min - minute

2 SYSTEM SUMMARY

2.1 System Configuration

The system features a GUI which can be used to instruct the robot. The user can simple click the connect button to connect the robot through the wifi but the only condition is that the computer and the robot should be connected to the same network. User can load a new survey map to the system using the load map button on GUI. User can also set NGZ using corresponding button.

2.2 Data Flows

User can provide input using the keyboard of the computer and using the mouse as well. The information such as robot's location on the survey map, data from the sensors of the robot will be visible on the GUI in real time.

2.3 User Access Levels

The is no security and authentication level included in the system.

2.4 Contingencies

The only factor which may degrade the performance of the system is the network speed. In the case of an emergency during the survey, a stop button is included in the GUI which will immediately stop the robot.

3 GETTING STARTED

This section is to provide instructions from initiation to exit. The reasonable arrangement of instructions allows users to understand the flow of the system and how to control robot better.

3.1 Logging On

Same wireless network environment is required for the robot and the program. Users need to ensure the robot and the computer in the same network environment.
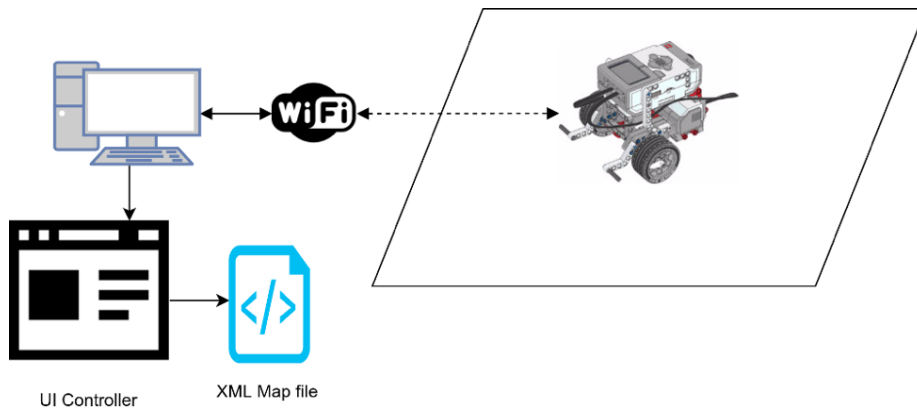

Figure 1: Connection Overview

3.2 Exit System

Click on Exit.

4   USING the SYSTEM

This section provides a detailed description of the robot system functions, which including the GUI functions and features that the robot has.

4.1   System Design

This section is to describe the whole GUI design, allowing the user control the robot easily. Different parts of GUI will be shown below.

4.1.1   System Status

This part is design for allowing the user know the connected status between the robot and the computer, including state of the system connection, the color sensor, and the ultrasonic sensor. When the status are connected, the icon will be changed from red to green.
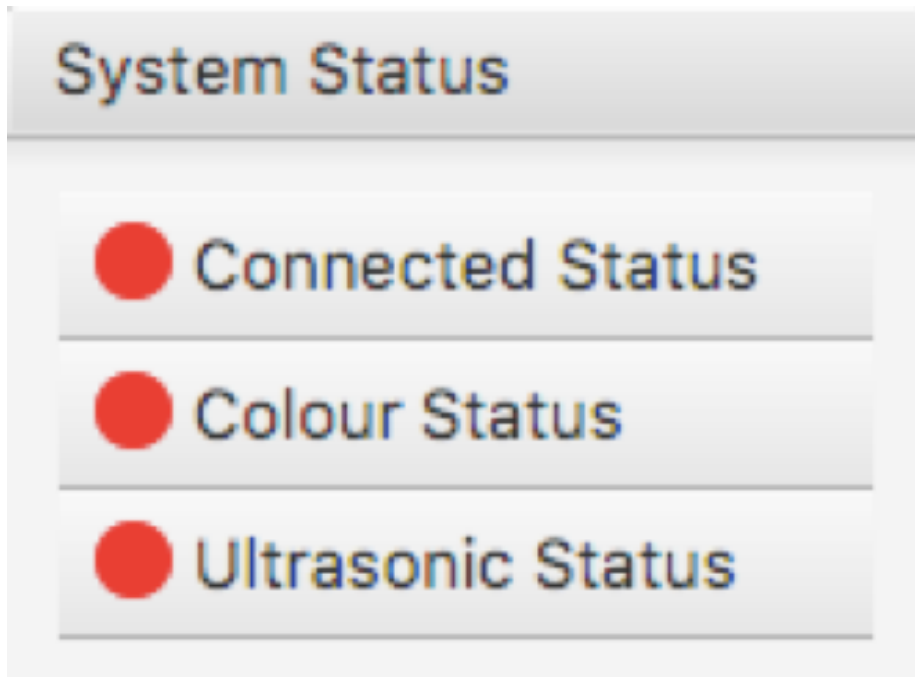

Figure 2: System Connection

4.1.2   System Mode and Status

This part is for the user to switch mode, including manual mode and automatically mode. The user can click one of modes to control the robot and user will see the current status of the mode on GUI.
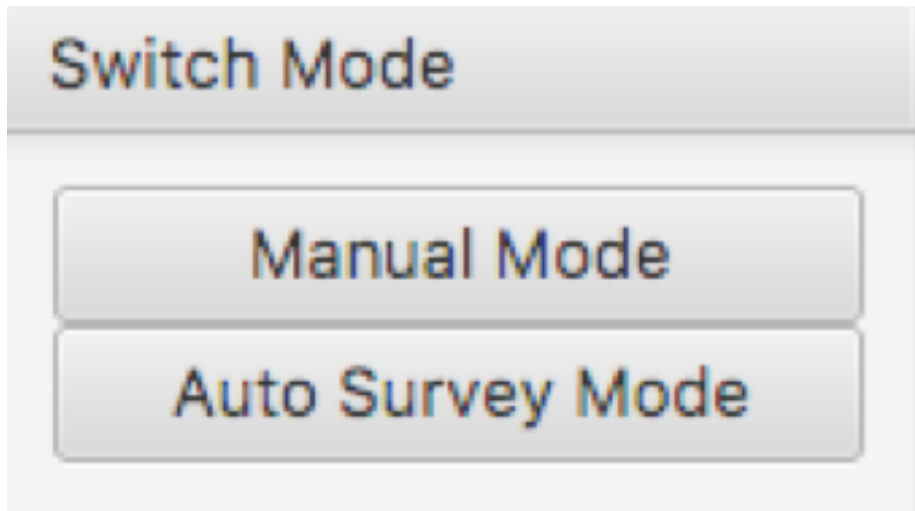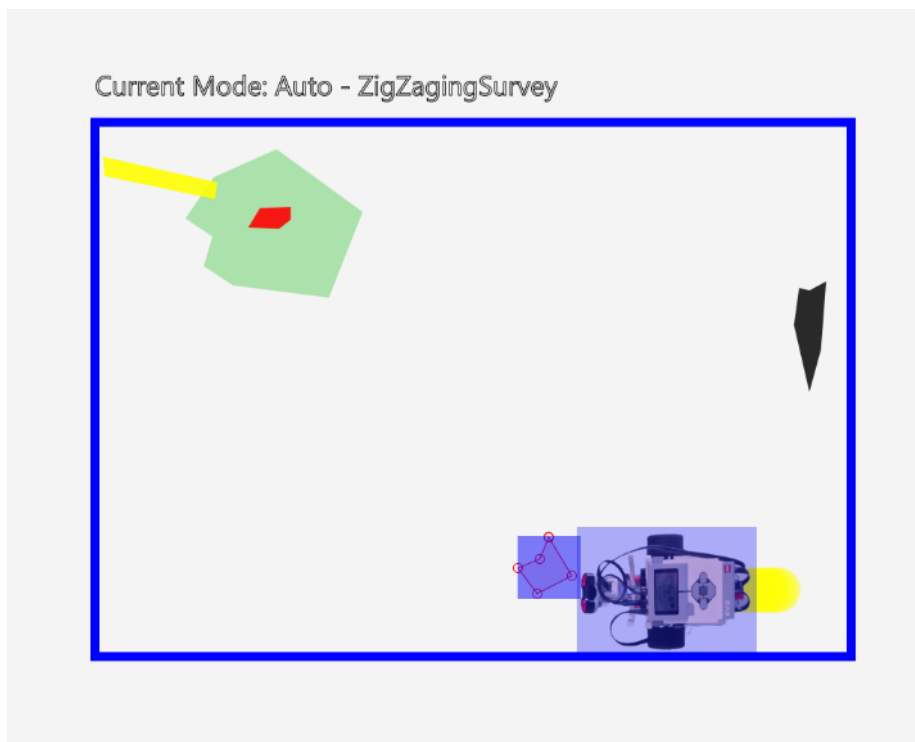
Figure 3: Mode Switch

Figure 4: Mode status

4.1.3 Manual Controls

This part is for the user to control the robot manually, including up, down, turning left and turning right. The red button in the middle is for stopping the robot for the user.
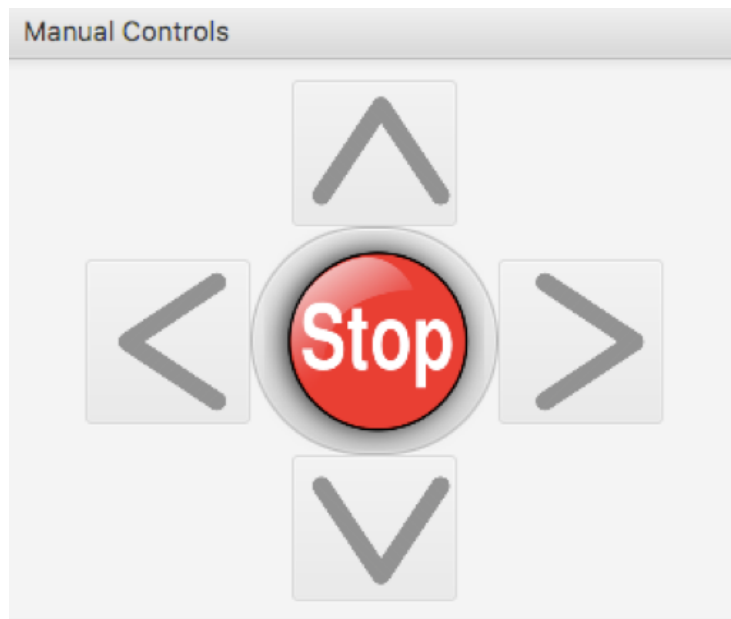
Figure 5: Manual Buttoons

4.1.4 Log Events

This part is for showing the system log, sensor graphs, and the current location of the robot on the map. The user can check the log and status when the robot is surveying on the map.
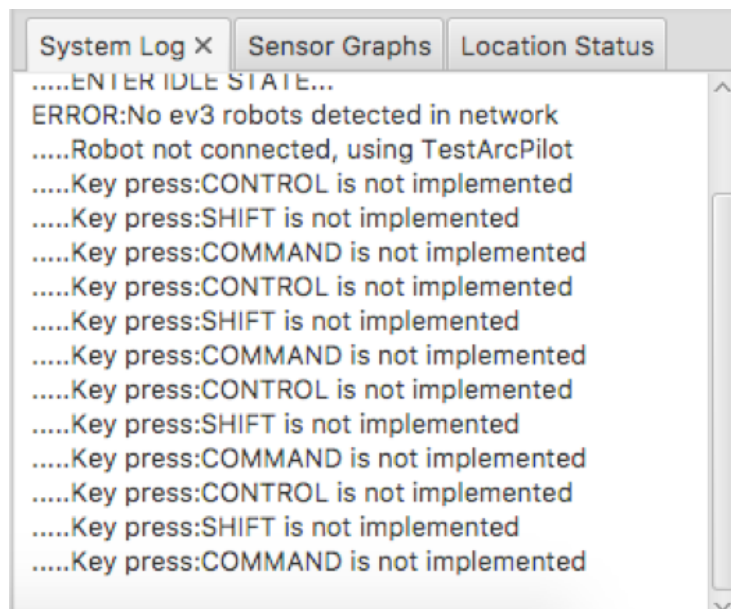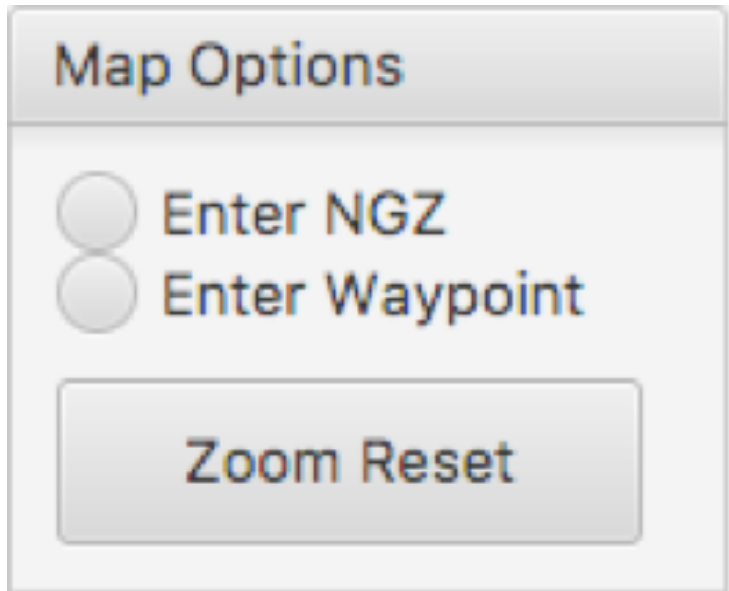

Figure 6: Log Events

4.1.5 Map Options

This part is for showing the system log, sensor graphs, and the current location of the robot on the map. The user can check the log and status when the robot is surveying on the map.
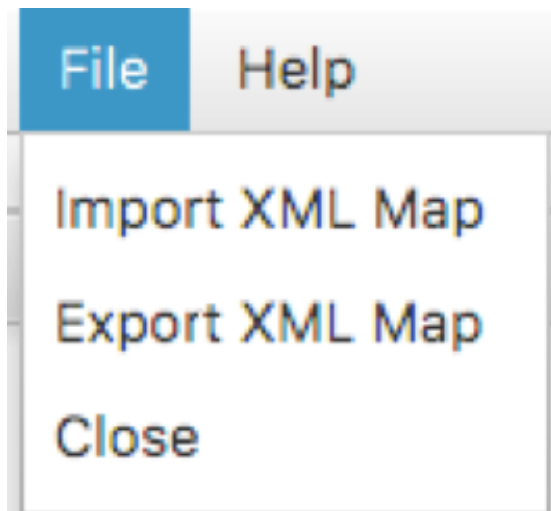

Figure 7: Map Options

4.1.6 System Mode

This part is for showing the system log, sensor graphs, and the current location of the robot on the map. The user can check the log and status when the robot is surveying on the map.

Figure 8: XML Map

4.2 System Features

4.2.1 Manual Enter NGZ

The user is able to designate the NGZ any time for avoiding potential dangerous areas of map detected by the remote operator.
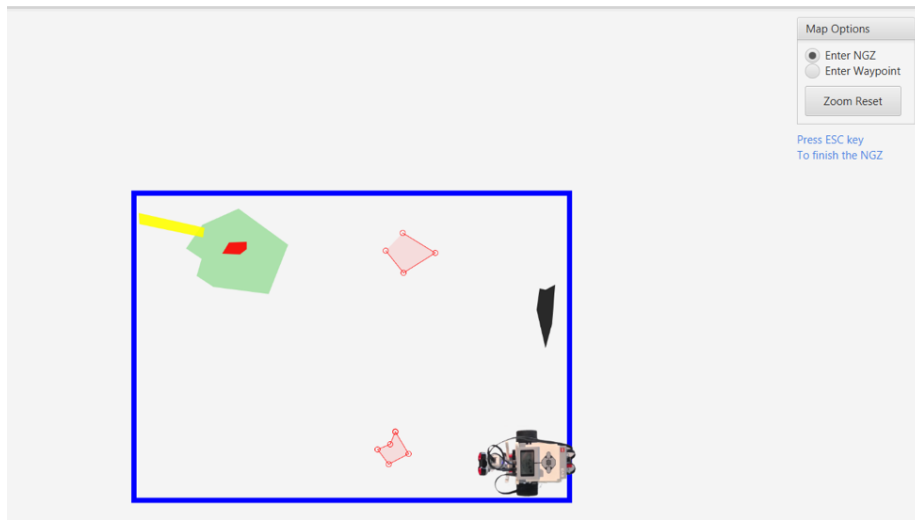

Figure 9: Enter NGZ

4.2.2 Avoiding the NGZ

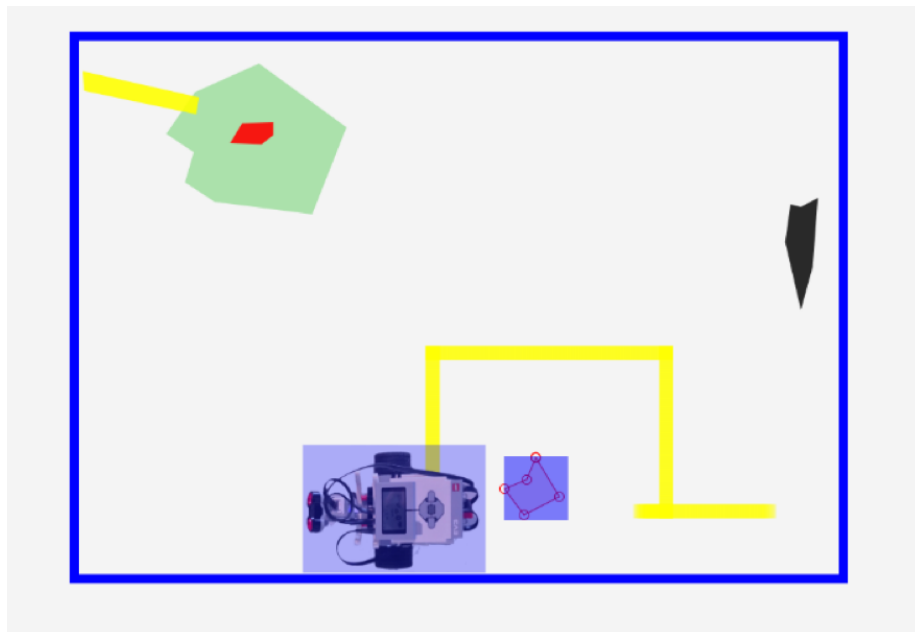The robot can avoid the NGZ when the robot is in automatically controlled.

Figure 10: Avoid NGZ

4.2.3   Move to Waypoint

When the user designated a waypoint, the robot can go to the waypoint directly.
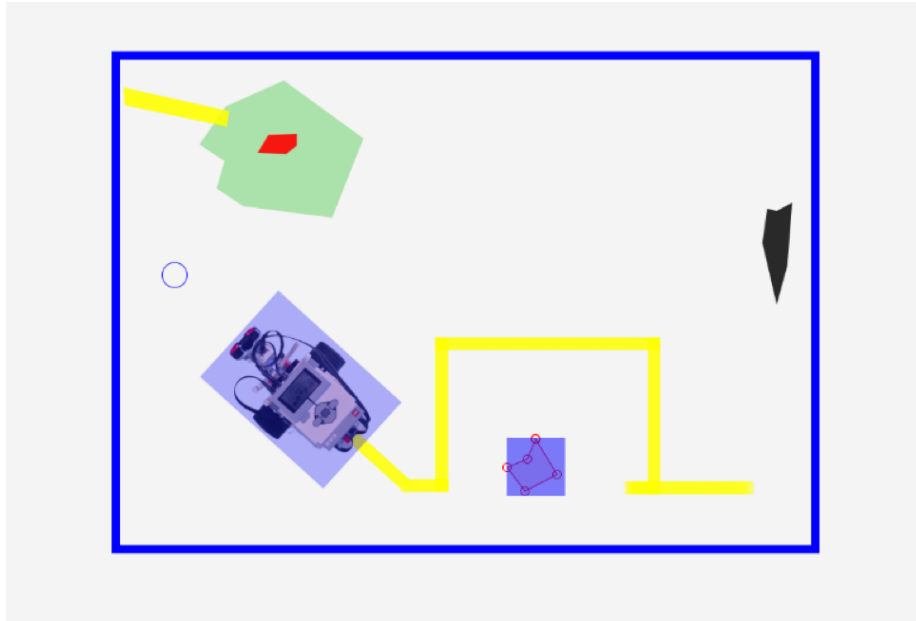

Figure 11: Waypoint

4.2.4   Displaying the Red Color

The robot will change red when the robot is closing to the crater, NGZ, or the obstacle.
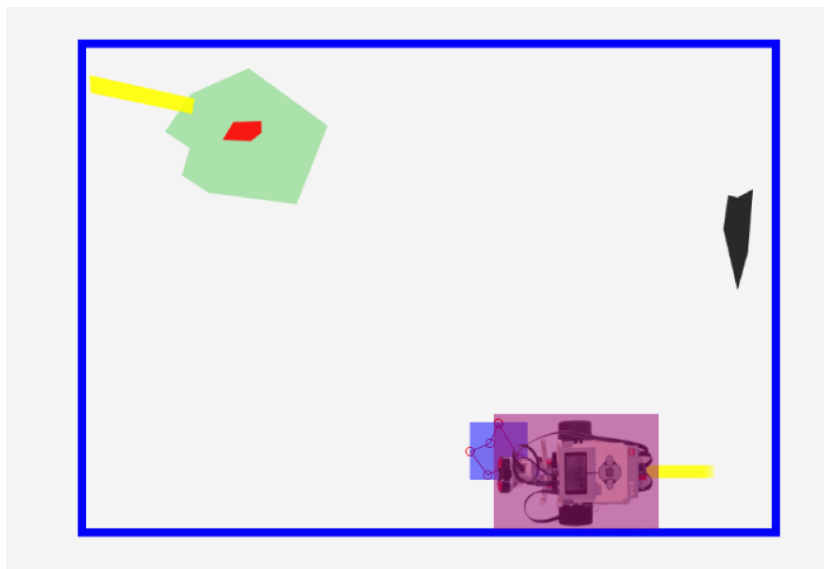

Figure 12: Display Red

4.3 Special Instructions for Error Correction

As a condition of your use of the Robot, you will not use the robot for any purpose that is prohibited or unlawful by these terms, conditions, and notices. You may not do any manner that could overburden, or impair, damage of the Robot. You will not be permitted to gain unauthorised access to the Robot.
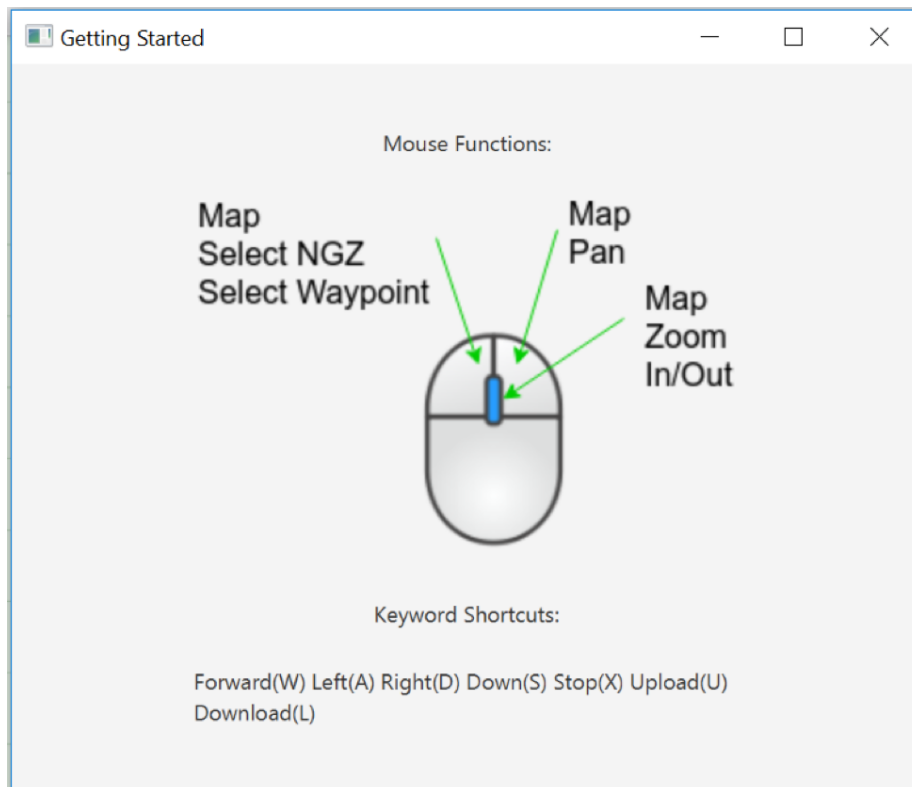
5 Appendices

Instructions flow:

Figure 13: Instructions